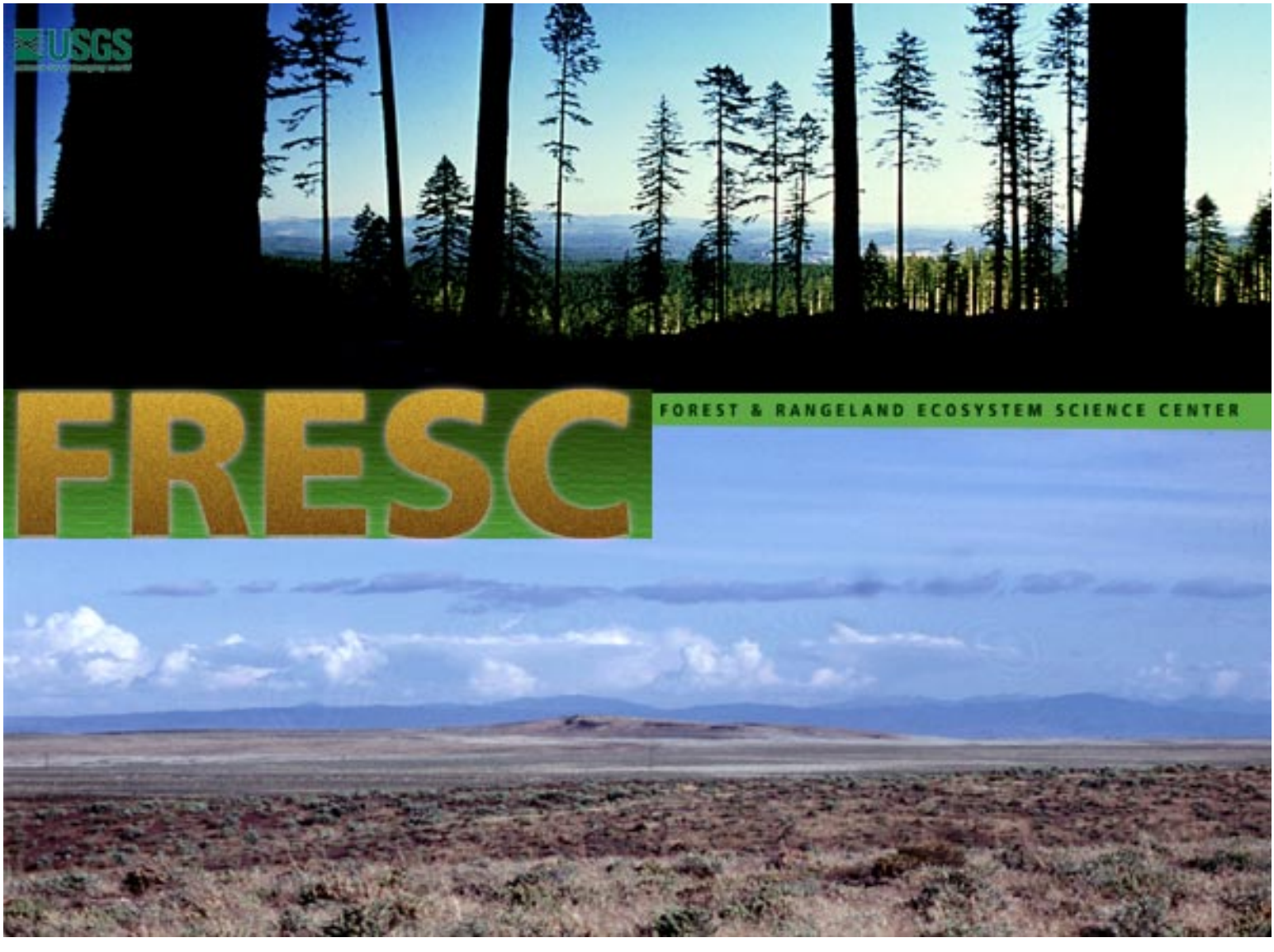

USGS
FRESC
FOREST & RANGELAND ECOSYSTEM SCIENCE CENTER

The Forest and Rangeland Ecosystem Science Center

(F R E S C)

provides research and technical assistance to support sound management and conservation of natural resources in the western United States.

MISSION

Formed in 1994, FRESC is one of 16 science and technology centers in the USGS. Our scientists work with federal and state agencies, local governments, and private organizations to provide a better understanding of forest, desert, rangeland, wetland, and riparian areas.

Much of our work provides information to the Bureau of Land Management, National Park Service, U.S. Fish and Wildlife Service, and other Department of Interior bureaus. Geographic areas in which we work include the Columbia Basin, Great Basin, Olympic Peninsula, Cascade Mountains, Coast Range, Colorado Plateau, and Mojave and Sonoran deserts.

NEW CHALLENGES

Natural resource managers and decision-makers are challenged to understand their resources as whole ecosystems.

Our staff of ecologists, wildlife biologists, range scientists, and aquatic biologists has the diversity and expertise to help meet this challenge.

Team-oriented research creates a capability that is greater than the sum of our individual talents.

Forest Ecosystems

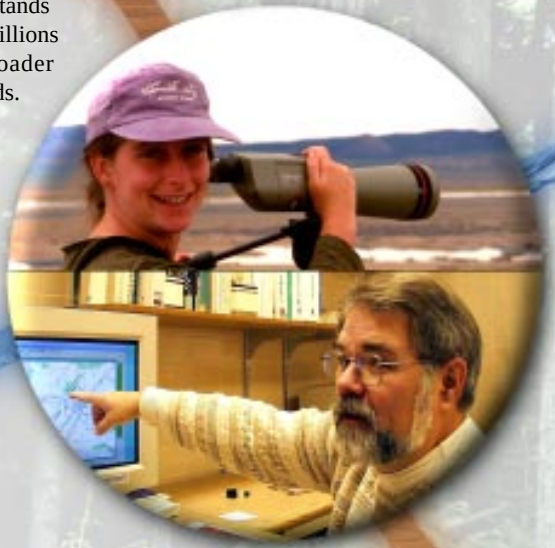
Forest managers in the western United States face major challenges in complying with the 1994 Northwest Forest Plan as well as integrating new findings regarding global climate change and fire ecology. These challenges have moved the framework of forest management from single forest stands and individual species to forest ecosystems encompassing millions of acres. FRESC's research is helping balance a broader understanding of forest values with traditional economic needs.

For example, many managers are striving to manage young forests so that they mature to resemble old-growth forests. We are analyzing tree-ring data collected from the stumps of recently cut old trees in western Oregon. Our findings strongly suggest that most large-diameter old Douglas-fir began life under much less crowded conditions and grew more rapidly than is typical of trees in young managed stands today. One conclusion from this and other research is that the practice of thinning young stands will likely speed the development of old-growth forests. Other studies are looking at the positive and negative effects of thinning on biodiversity.

Aquatic Ecosystems

The Great Basin of the western United States is characterized by the absence of surface water flowing from its border. However, wetlands abound in this area and function like desert oases for hundreds of thousands of birds. Nearly half of North American waterbird species (shorebirds, ducks, geese, gulls, and others) use these wetlands. FRESC scientists are studying the habitat, population dynamics, migrations, genetic characteristics, and environmental contaminants of Great Basin birds in order to determine how healthy bird populations can be maintained in the face of a growing demand for water by agriculture, mining, and municipal and industrial water consumers. Many of these studies are providing critical input to a national shorebird conservation plan.

Wetland Ecosystems



Arid E

Wetland Ecosystems

Walking across a desert, most of us would not notice the living, growing crust on the soil surface. We are just beginning to appreciate the crucial ecological value of these crusts, which are made up of cyanobacteria, mosses, and lichens. Their sticky surfaces glue soil particles together which reduces wind and water erosion and slows runoff of rainfall, allowing more water to move into the soil. The crusty organisms also contribute nutrients and organic matter, increasing soil fertility. Many land-use practices damage these crusts, and recovery can take hundreds of years. FRESC is investigating ways to minimize human impacts, restore damaged areas, and facilitate more sustainable desert uses.

One summer day in 1896, an adventurous scientist climbed down the steep walls surrounding Crater Lake in Oregon and rowed out across the lake with a dinner plate in his pack. His objective was not lunch, but rather the first recorded measurement of lake clarity. Building on these simple beginnings, scientists have studied this remarkably clear lake in order to document its qualities and monitor its health. FRESC works with the National Park Service to observe clarity and other properties of Crater Lake with sophisticated instruments. These efforts provide a better understanding of the lake's natural cycles, which have remained nearly pristine since 1896.

Arid Ecosystems

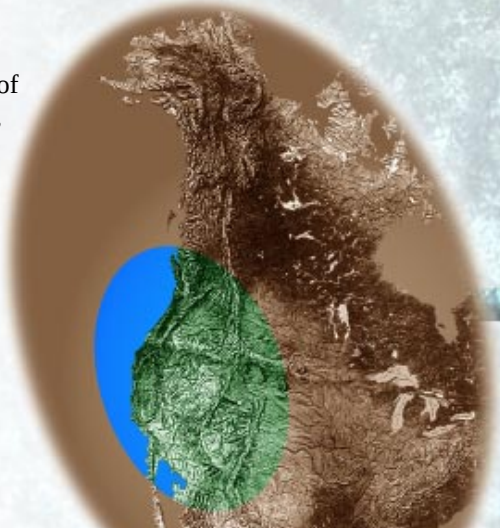
We are also studying the long-term dynamics of high-mountain lakes within the Cascade Mountains. Many lakes are experiencing disruptions and heavy losses of amphibians due to the introduction of nonnative fish. We are pioneering efforts to restore these lakes by removing exotic species and promoting habitat protection for native species.

Wildlife

Wildlife research provides essential understanding for complex management questions. FRESC's studies of the Brown-headed Cowbird, for example, assist with efforts to protect riparian songbirds in the western United States. Originally the cowbird was primarily associated with bison in the central plains but it has now spread across the continent following domestic livestock. The cowbird is a brood parasite; it slips its eggs into the nests of other birds. The bird host raises the cowbird young at a significant cost to its own young. We have found that in some populations of the endangered Southwestern Willow Flycatcher, for example, parasitism rates average over 50%. With the information we provide about cowbird parasitism, managers can decide how best to manage cowbird populations, as they work to improve breeding habitat for songbirds.

Contaminants

The river otter is often the top predator in aquatic food chains, making them useful for studying exposure of wildlife and humans to chemicals in lakes, rivers, and streams. FRESC recently completed a study of otters in the Columbia River and found that the reproductive organs of young male otters were smaller than on otters in other locations. This difference was correlated with a variety of chemicals found in the Columbia River. We are working to identify the contaminants responsible for the deformities.



Biology

Conservation Biology

Deforestation, agriculture, and residential development result in fragmentation of wildlife habitat. This is particularly harmful to species which are rare or have limited mobility, such as amphibians. Patterns of genetic diversity are critical to understanding the effects of fragmentation. For example, FRESC scientists determined that larch mountain salamanders found in Oregon differ genetically from those just across the Columbia River in Washington. We are using this information to define conservation units for salamander recovery. We also are developing survey methods that will more accurately assess the status of many other rare or endangered species.

Restoration

The federal government manages millions of acres west of the Rocky Mountains and east of the Cascade Mountains and the Sierra Nevada. These arid lands, called the Intermountain West, are biologically rich and contain large areas of undeveloped land capable of providing the seeds for regional ecosystem recovery. However, land uses continue to alter this region, in some cases to catastrophic proportions. Of particular concern is the rapid invasion of cheatgrass and other non-native species. The invasions can change a productive and highly diverse region into a landscape of weeds, which in turn, greatly increases the frequency of wildfires. FRESC is tracking invasions of non-native species and studying altered fire patterns to develop techniques to minimize land use impacts and restore damaged areas.

Information Management

FRESC's commitment to research is balanced with a strong commitment to distribute the results of our research to interested groups in a variety of formats. We emphasize publication of research in peer-reviewed scientific journals, but also publish in technical outlets accessible to public land managers. Our scientists convey information through meetings and workshops, and regularly conduct site visits to convey information to resource managers, students, and the public. Information on all our studies is archived and available via the internet. FRESC scientists currently direct over 200 research projects. Details are available through the USGS Science Information System web site: http://biology.usgs.gov. Follow the link to "Current Projects SIS."

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http://www.usgs.nau.edu

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